NetWare Product Overview

1987

NetWare Product Overview

Revision 2.01 December 1986

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About the NetWare Product Overview

Audience, Purpose, and Scope

The *NetWare Product Overview* is geared toward

1) **Beginners** who want a brief, nontechnical introduction to Novell's product line, and

2) **Intermediate and advanced users** who want a brief overview of Novell's product line, including the technical specifications for each product.

The *NetWare Product Overview* is not comprehensive. Comprehensive supporting technical information may, however, be found in the product specification sheets available at your local NetWare dealer.

How to Use the Product Overview

Beginners may wish to first read Appendix A, "Networking, An Introduction," at the end of this booklet, then read the product information itself.

Intermediate and advanced users may wish to read the product information as needed.

For example,

* Those who want the briefest possible overview of the product line may simply want to read the title pages for each section.

* Some may want to read the whole NetWare Product Overview, including the narrative descriptions of the products.

* Knowledgeable networkers may only want to skim the summaries in the outer column of the product descriptions and read the technical specifications for the products they're interested in.

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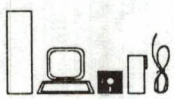
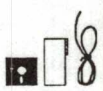
Novell Products

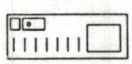
Section

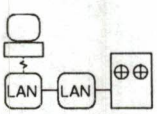
NetWare. Novell's superior PC networking software, the foundation of Novell's product line. 1

NetWare Servers. High-performance file servers covering the full spectrum of networking needs. 2

NetWare Server Systems. NetWare servers combined with the NetWare operating system, network boards, and appropriate connection hardware--a complete solution.  3

Independent Server Systems. The NetWare operating system, network boards, and connection hardware for use with a separately-purchased, third-party file server.  4

NetWare Subsystems. High-quality hard disk subsystems, add-on drives and controllers, and the fastest backup systems available for NetWare.  5

Communications Products. LAN-to-Remote PC, LAN-to-LAN, and LAN-to-Host communications. 

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A: Networking, An Introduction
B: NetWare-Supported Hardware
C: How to Get More Information

Section 1

NetWare

NetWare, Novell's superior networking software, is the foundation of Novell's product line. Introduced in 1983 and now in its seventh generation of development, NetWare has been proven by over a third of a million users worldwide. Ninety-seven percent of NetWare users surveyed are happy that they selected NetWare, and would recommend it to their associates.

Introduced 1983

Mature technology

Over a third of a million users

Rapidly becoming a de facto industry standard, NetWare leads the way in **compatibility** with industry standards, application software, and hardware.

It offers unparalleled **connectivity**, **expandability**, and **communications** abilities.

It **outperforms** other LANs by several times.

Its **security** is flexible and comprehensive.

It's **easy to learn and use**.

A de facto industry standard; unparalleled
- Compatibility
- Connectivity
- Expandability
- Communications
- Security
- Ease of use

And **System Fault Tolerant (SFT) NetWare**, an industry first, provides **comprehensive data protection**.

Fault Tolerance

All these things make NetWare the most powerful Local Area Network (LAN) operating system available.

COMPATIBILITY

NetWare leads the industry in compatibility with PC networking standards, so NetWare is compatible with virtually all PC networking software and hardware. And NetWare can coexist with many non-NetWare products on the same network.

Compatible with PC networking standards, virtually all PC networking software and hardware

Coexists with non-NetWare products

Application Software. Since NetWare is fully compatible with PC DOS 3.1 and 3.2, application software developed for DOS 3.1 and DOS 3.2 runs unmodified on NetWare. This means that NetWare supports virtually all PC applications software, since most of this software is written to work with DOS 3.1 and 3.2. NetWare also continues to support DOS 2.0, 2.1, and 3.0, and thus continues to support pre-DOS 3.1 multiuser application software.

DOS 3.1 & 3.2 compatible

NetWare is fully compatible with NETBIOS, an industry standard which controls how software interfaces with IBM and IBM-compatible hardware. NetWare's NETBIOS compatibility means that NetWare supports all software and hardware designed around NETBIOS, including software and hardware developed for the IBM PC and Token Ring networks.

NETBIOS compatible

Over 1,000 of the world's best-known software houses work with Novell through Novell's Independent Software Vendor (ISV) program to develop software that not only runs on NetWare, but takes advantage of NetWare's superior functionality and performance. As a result, NetWare supports over 4,000 multiuser software packages and over 40,000 single user packages. Since it's very likely that NetWare supports your current software, NetWare saves your data and your investment in software and training.

1,000 software houses work with Novell to develop software for NetWare

4,000 multiuser packages

Over 40,000 single user packages

Hardware-independent

Network Hardware. With support for 27 brands of network hardware built into the operating system, NetWare is the only hardware-independent LAN on the market today. (For a list of hardware supported by NetWare, see Appendix B, NetWare-Compatible Hardware.) NetWare supports every major network topology and every major manufacturer's hardware (including IBM's PC and Token Ring Networks, AT&T Starlan, and many Ethernet-type networks). NetWare saves current hardware investments and lets you choose the hardware that best suits your price/performance needs. Best of all, NetWare's consistent user interface means that, to the user, NetWare looks the same no matter what hardware it's running on.

Consistent user interface

Can coexist with non-NetWare products on same network

Coexistence with Non-NetWare products. NetWare can coexist with many non-NetWare products, such as packages developed by IBM for PC-to-mainframe communications. Since both NetWare and non-NetWare products can run on the same network simultaneously, you're not limited to using only NetWare on a NetWare network. This is important now and in the future, since it means that NetWare will support important new products being developed by IBM (based on APPC and LU 6.2 protocols).

NetWare's unmatched compatibility paves the way to NetWare's unmatched connectivity, expandability, and communications capabilities, discussed next.

CONNECTIVITY

Bridge networks transparently

NetWare lets you connect (or bridge) all of the networks it supports. Bridged networks can communicate and share information, all transparently (that is, NetWare does all the work without the users' knowledge).

Bridging lets you purchase a network and add other networks as necessary, without making the original hardware obsolete. Bridging also lets departments using different networks share data and communicate, whether or not the departments' networks are the same hardware type.

Protect investment in hardware, software, and training

Bridging protects your investments in training, software, and hardware, because you don't have to retrain users, buy new applications software, or discard your current hardware.

EXPANDABILITY

NetWare networks never stop meeting your needs, because they are expandable in every sense of the word: in size, disk storage and memory, performance, and reliability (data protection).

Increase network size by adding file servers, bridging

Size. It's easy to increase the size of a NetWare network. Workstations and file servers may be added until you reach the limit for the particular network. Then you can simply bridge the network to another network and continue adding workstations and servers.

IUp to 2 GB disk storage, 16 MB RAM

Disk Storage and Memory. It's just as easy to increase the disk storage and memory capacity of a NetWare network. Disk subsystems may be added to increase hard disk storage capacity to as much as 2 GB. Because NetWare can run in protected mode on 286-type file servers, NetWare supports up to 16 MB of RAM (Random Access Memory). When you add

hard disk storage, you must also add enough RAM to manage the hard disk, so NetWare's ability to support 16 MB of memory is closely connected to NetWare's ability to support 2 GB disk storage. Additional RAM also improves performance.

Performance. Many options are available to upgrade network performance. You can replace a server with a higher-performance server, or add an additional server. You can also replace network hardware with higher-performance hardware, or put additional Disk Coprocessor or network boards in the file server to speed up network traffic. (Having several boards in the file server is like having a highway with several lanes instead of one: more traffic can move at the same time.) You can also upgrade to a more powerful version of NetWare.

Increase performance by:

Upgrading server, adding additional server

Upgrading hardware, adding Disk Coprocessor or network board(s)

Using more powerful version of NetWare

No matter what option you may choose, a NetWare network's performance will grow right along with your needs.

Reliability (Data Protection). NetWare utilizes sophisticated techniques to ensure data integrity. NetWare checks data after it is written to disk to ensure the data is correct. NetWare also duplicates key information in case of loss.

Read-after-write verification

You can increase NetWare's already excellent reliability by adding the additional levels of data protection which System Fault Tolerant (SFT) NetWare offers. (See the explanation of SFT NetWare at the end of this section.)

Duplication of key info.

SFT NetWare

COMMUNICATIONS

NetWare offers complete communications abilities.

Communications:

In addition to LAN-to-LAN communications (bridging, discussed above), NetWare offers LAN-to-Remote and LAN-to-Host communications. LAN-to-Remote communications lets remote users access the network by using modems, and thus use all network services. LAN-to-Host communications lets network users access IBM SNA host mainframes or asynchronous hosts of all types, including mainframes and public communication networks like MCI Mail and The Source.

LAN-to-LAN

LAN-to-Remote

LAN-to-Host

PERFORMANCE

NetWare software dramatically improves the speed and performance of every type of network hardware it supports. NetWare's inherent distributed nature, use of proven operating system techniques, and unique design features bring high performance to the PC LAN environment.

Improves speed and performance of every network it runs on

INHERENT DISTRIBUTED NATURE

Distributed Processing. Under NetWare, each workstation is an independent computer which does its own processing. The file server manages the shared resources and coordinates network activity, but doesn't actually process data. This is called distributed processing.

Distributed processing means each additional workstation increases system's total processing power

Because each workstation has its own processing power, adding PCs to the network increases the system's total processing power. In contrast, adding terminals to mini and mainframe systems splits the processing power among the terminals, decreasing the power available to each user.

For many computer applications, distributed processing is more efficient and cost effective than time-sharing on mini and mainframe computers.

PROVEN OPERATING SYSTEM TECHNIQUES

True multitasking OS

Singletasking vs. Multitasking. NetWare is efficient because it is a multitasking operating system. Unlike singletasking operating systems, such as DOS and IBM's PC Network program, NetWare can service several workstation requests and several hard disks simultaneously.

The performance difference between a singletasking and multitasking operating system can mean the difference between accessing files immediately or waiting. And it is magnified with every workstation on the network.

NetWare improves performance by using:

Directory Hashing

Directory Hashing. NetWare minimizes the time it takes to find a file by organizing information so the system can find what it needs quickly. Specifically, NetWare indexes file directory locations so it only needs to examine a few directories to find a file (similar to the way that dictionary entries are alphabetized so you can find an entry quickly, instead of scanning through the dictionary until you find what you need).

Directory Caching

Directory Caching. NetWare minimizes the time it takes to find a file by putting important information in the most quickly-accessed place.

NetWare stores a copy of directories (information used to locate files) in the file server's RAM. Accessing RAM is hundreds of times faster than accessing the hard disk, so directory caching significantly increases network performance. And, since the disk is accessed less, directory caching also helps eliminate disk access bottlenecks.

File Caching

File Caching. NetWare continually tracks which parts of files are used most often, and stores them in RAM. File Caching increases performance just as Directory Caching does (see above).

NetWare also increases performance by "planning ahead" based on this reasoning: if you ask for one part of a file, it's likely that you will soon ask for another part located nearby. Anticipating the subsequent requests, NetWare reads information from the disk in large blocks, and puts it all in RAM. This increases performance by saving "trips" to the disk, reducing access time, and helping eliminate disk bottlenecks.

Elevator Seeking

Elevator Seeking. The disk read-write head travels across the disk and picks up files in its direction of travel, much like an elevator taking floor requests. When the head reaches the end of the disk, it goes in the other direction, picking up the newly added requests. Picking up requests this way is more efficient than picking them up on a first-come, first-served basis, because the read-write head doesn't have to do as much traveling. Elevator seeking significantly decreases disk wear and tear and increases disk throughput up to 50 percent.

UNIQUE DESIGN FEATURES

Designed specifically for networking

NetWare and DOS. Unlike DOS, which was designed for single workstations, NetWare was designed specifically for networking. NetWare

networks run NetWare in the file server, which manages the shared resources, and DOS in the individual workstations, which do their own processing. Each operating system is used to do what it does best.

DOS runs in workstations

NetWare runs in file server

A special piece of software called the NetWare shell lets NetWare in the file server communicate with DOS and the application software in the workstations. NetWare remains unchanged, regardless of what software is running in network stations. That is why NetWare networks can support many hardware types and multiple versions of DOS on the same network simultaneously.

NetWare shell lets them communicate

Highly Optimized Read and Write Paths. Reading from and writing to the file server hard disk occurs more frequently than any other network task. So NetWare is specially designed to perform file reads and writes as quickly as possible. The critical instructions which control disk reads and writes are written in highly efficient assembly language--the fastest language to actually execute.

Highly efficient read and write paths

Critical instructions written in machine language

Multiple Network Boards/Additional Disk Coprocessor boards in File Server. You can effectively double, triple, or quadruple network performance by putting one, two, or three additional network boards in the file server. (This doubles, triples, or quadruples the network communications bandwidth, which is the "path" workstations use to access the file server.) You can also double network performance by putting an additional Disk Coprocessor board in the file server. (This doubles the the disk channel bandwidth, which is the path used to access the disk.)

Double, triple, quadruple performance by adding one, two, or three additional network boards

Double network performance by adding Disk Coprocessor board

Both techniques solve LAN performance problems for the cost of the additional board(s). No other LAN operating system uses all of these techniques. As a result, no other LAN operating system offers the performance and growth potential that NetWare offers.

SECURITY

NetWare security is flexible and complete.

Flexible, complete multilevel security

A network supervisor controls network security, which may be implemented on the file server, directory, and file levels. Access to network resources is based on user profiles which the supervisor assigns. Individuals can also protect their personal data.

There are four types of NetWare security:

Four levels of security:

1) **Login/Password** security controls access to the server.

Login/Password

2) **Trustee** security determines a user's profile, which in turn determines which directories the user can access.

Trustee

3) **Directory** security determines a directory's profile, which in turn determines what users can do in the directory.

Directory

4) **File attributes** security determines what may be done with an individual file.

File attributes

Each type of security has its own set of rights and attributes which may be used separately or in combinations, making NetWare security as simple or complex as desired.

EASE OF USE

NetWare contains many features which help make it easy to use.

NetWare supports most DOS commands

NetWare and DOS Commands. NetWare supports almost all DOS commands. In addition, NetWare commands are very similar to DOS commands, so DOS users will find NetWare networks easy to use.

NetWare commands are similar to DOS commands

Extensive on-line help

On-line HELP. NetWare contains a complete on-line HELP facility. HELP is easy to use because it's menu-driven, and begins with overviews which lead to detailed explanations.

Special menu utilities designed especially for novices

On-line tutorial

Menu Utilities/On-line tutorial. Advanced NetWare and SFT NetWare include menu-driven utilities designed especially for novice users. Most NetWare commands are incorporated in the menu system, which guides novice users through the commands. An on-line tutorial, which uses the menu utilities to walk users through common network tasks, is also available.

Supervisors can use the Menu Maker utility to create custom menus. For example, supervisors might want to create a menu that allows users to go directly to the applications they use--without ever seeing the operating system command line.

The menu utilities and on-line tutorial enable NetWare novices to become productive in only a few hours. Command line utilities are still available for advanced users.

TYPES OF NETWARE

Two basic categories of NetWare are available: Advanced NetWare and SFT NetWare.

ADVANCED NETWARE

Various types of Advanced NetWare are available. There's little difference in functionality, however. The main difference is that the various types of Advanced NetWare are designed for file servers which use different types of microprocessors.

Advanced NetWare 68: Novell's S-Net, 68B servers

Advanced NetWare 68 runs on Novell's proprietary S-Net and 68B file servers, which use a Motorola MC68000 microprocessor.

Advanced NetWare 86: IBM PC, PC-XT, PC-AT, and compatibles

Advanced NetWare 86 runs on the IBM PC, PC-XT, and compatible file servers, which use the Intel 8088 microprocessor. It also runs on the IBM PC-AT. (Although the AT uses an 80286 processor, the 80286 can emulate the 8088 processor.)

Advanced NetWare 286: Novell's 286A, 286B file servers
IBM PC-AT and compatibles

Advanced NetWare 286 runs on Novell's 286A and 286B file servers, the IBM PC-AT, and AT compatibles, which use the Intel 80286 microprocessor. Advanced NetWare 286 is also available in a non-dedicated version.

SYSTEM FAULT TOLERANT NETWARE

System Fault Tolerant (SFT) NetWare is an industry first. In addition to the advantages of Advanced NetWare 286, SFT NetWare adds features which allow a network to function even if one or more components fail. Thus, SFT NetWare solves the major weakness of workstation and LAN-based distributed processing, which is multiple potential points of failure.

SFT NetWare protects against system failure

SFT NetWare has several protection levels, which may be implemented as your needs require or your budget allows.

May be implemented in levels

Level I protects your data against **media defects**. A feature called **Hot Fix** detects damaged areas on the hard disk and automatically writes data to undamaged areas. Hot Fix is completely user-transparent.

Level I protects against media defects, features Hot Fix

Level II protects your data against **disk failures** by using disk mirroring and disk duplexing.

Level II protects against disk failures, features disk mirroring and disk duplexing

Disk mirroring consists of keeping copies of the same data on two physical disks. If one disk fails, the file server can use the other (mirrored) disk. Mirroring virtually guarantees that data will not be lost due to disk failure.

Disk duplexing consists of duplicating the disks, disk drives, controller boards, disk coprocessor boards, and cabling--all components involved in accessing the disk. Then, if any component fails, you can use the duplicate component. Disk duplexing also doubles the disk performance.

An option called the **Transaction Tracking System (TTS)** is also available with SFT Level II. TTS is the most powerful capability of SFT NetWare, because TTS protects against database corruption in case of workstation or file server failures, which are more common than disk failures.

TTS protects against database corruption

In distributed multiuser systems, many workstations can be updating the same files and databases simultaneously. Because more components are involved, the possibility of failure is increased. Thus, TTS solves the major weakness of distributed multiuser LANs.

Most database changes consist of several file write operations. With TTS, the system views these changes as a single transaction that must be wholly completed or wholly backed out (no changes made at all). If a system failure occurs during a transaction, TTS undoes all database changes made by the transaction, returning the database to its previous state. Without TTS, file server or workstation failure can cause database contamination, resulting in lost, inaccessible, or incorrect records over a period of time. (In many cases, database contamination is hard to detect immediately.)

Having TTS could mean the difference between losing an *entire database* or merely losing the latest transaction.

Only nonproprietary system of its type

TTS is the only nonproprietary system of its type on the market today. All other systems like it are proprietary, and require special applications software. Almost all other transaction tracking systems run on extremely expensive mainframes or minicomputers. NetWare TTS will work with off-the-shelf DOS 2.0 and above compatible multiuser software.

Uses standard hardware components

Works with off-the-shelf DOS 2.0 and above multiuser software

SFT NetWare is a highly cost-effective way to protect data because SFT NetWare can be implemented in levels. And the standard hardware components which SFT NetWare uses are less expensive than a fault tolerant minicomputer or mainframe.

If data integrity is important, than SFT NetWare is essential.

SUMMARY

A de facto industry standard, NetWare offers unparalleled

- Compatibility
- Connectivity
- Expandability
- Communications
- Security
- Ease of use

Fault Tolerance

NetWare is the PC LAN industry standard. It leads the way in **compatibility** with industry standards, application software, and hardware.

It offers unparalleled **connectivity**, **expandability,** and **communications** abilities.

It **outperforms** other LANs by several times.

Its **security** is flexible and comprehensive.

It's **easy to learn and use**.

And **SFT NetWare**, an industry first, lets you rest easy, knowing your data is safe.

If you need to network your PCs, you need NetWare.

Section 2

NetWare Servers

The file server is the heart of a network. File server performance is perhaps the most important factor in overall network performance. So the file server you choose for your network is critical.

Novell's high-performance NetWare Servers offer excellent solutions to your networking needs. All NetWare Servers are specifically designed for networking. All come with the NetWare operating system preinstalled. And with several models to choose from, you can be sure of finding one that's right for you.

This section introduces the following servers:

* 68B
* 286A
* 286B

NetWare Server 68B

Mature techology

Novell's NetWare Server 68B is a high-performance file server machine which builds on three years of technology proven by over a quarter million users worldwide. Satisfied users range from small businesses to Fortune 500 companies. The 68B's mature technology is backed up by experienced support personnel.

Preinstalled operating system--"NetWare Ready"

The 68B file server is "NetWare Ready." NetWare, Novell's superior network software, is installed right on the file server's hard disk. This saves time and money, and eliminates any room for error in the software installation. The 68B includes System Fault Tolerant NetWare Level I which provides data protection.

Supports S-Net and ARCNET-compatible topologies internally

The 68B file server supports two excellent network topologies, S-Net and RX-Net. (RX-Net requires Advanced NetWare 68 2.01 or above.) The S-Net topology's unique design assures that network speed and performance remain constant under heavy network use and as the network is expanded; the RX-Net (ARCNET-compatible) topology offers great flexibility and expandability. Printer capability can expand to five printers per file server with either the Parallel/Serial Printer Board, which provides three parallel ports and one serial port, or the serial printer board, which provides four serial ports.

Parallel and serial printer support

Easy to install and maintain

Networks which use a 68B file server are easy to install. In the case of the S-Net topology, it's as simple as cabling network components directly to the appropriate ports (plug-ins) on the back of the server. If you want to use more than 24 workstations or take advantage of the RX-Net system's flexibility, you can install an RX-Net LAN board in the 68B server. Installing RX-Net hardware is as simple as connecting workstations to connection hardware called hubs, connecting the hubs, and cabling the hubs to the RX-Net board in the server. The RX-Net LAN board includes a 6-port hub internal to the 68B server.

Maintenance is easy too, since failure of an individual component is easy to isolate and doesn't affect the rest of the network.

Bridges to all network hardware types which NetWare supports

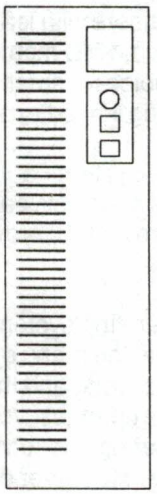
Networks that use the 68B file server can bridge to (connect to and work with) all the types of network hardware which NetWare supports (see Appendix B, NetWare-Supported Hardware). You can easily expand your original network by connecting it to another network, saving your original hardware investment. And your original network can communicate with your new network. Users never know the difference.

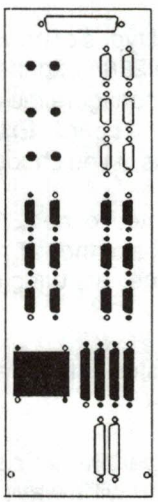
User-transparent

Standardized software

Best of all, both networks look the same to anyone who uses them, since NetWare runs the same way on all the hardware it supports. All of your application packages run the same way on the network you add, too. This standardization reduces the time and expense associated with training, leaving network users free to do what they do best instead of learning and relearning how to use the network.

NetWare Server 68B





Specifications:

Processor: Motorola MC68000
Clock Speed: 8MHz
Addressable Range: 16MB
RAM: 1-8MB
Operating Systems: Advanced NetWare 68, SFT NetWare 68 Level I
Mass Storage: up to 2GB
Reset: Keylock
Power Supply
Printers: 1 - 5 serial
Topologies: S-Net, RX-Net
UL Approved

Configuration:

SFT NetWare 68 Level I Operating System installed
4MB memory
Serial printer port
Disk interface port
LAN board with 6 S-Net network interface ports
Manuals

NetWare Server 286A and T286A

80286 performance
1MB memory
42MB internal hard disk
3 printer ports

Novell's NetWare Server 286A[1] provides users with leading edge technology at an affordable price. Its high performance, 1MB memory, 42MB disk capacity, and 3 printer ports make it an excellent choice for small to mid-sized networks requiring high performance and anticipating limited expansion.

Preinstalled operating system--"NetWare Ready"

The 286A file server is "NetWare Ready"--System Fault Tolerant NetWare 286 Level II is installed right on the file server's hard disk, saving time and money, and reducing room for error. SFT NetWare Level II provides disk mirroring and disk duplexing for data protection.

"Generic" operating system is easy to install and maintain

Advanced NetWare 286 is a "generic" operating system which is easily customized to fit a network. Simply choose the menu options which specify the correct information for your specific network, and the operating system configures itself. If your network hardware changes, you can easily reconfigure the operating system. The ease of configuring and reconfiguring the operating system makes networks that use the 286A file server easy to install and maintain.

Supports every major topology and brand of network hardware

The 286A supports every major brand of network hardware sold (including IBM's PC and Token-Ring Networks, Ethernet, RX-Net, and AT&T Starlan), offering unparalleled flexibility. You can use your existing or your favorite hardware when your network is run by a 286A file server.

Run 4 like or unlike networks from same server simultaneously--can bridge more than 4 networks if necessary

The 286A can support up to four different types of networks--*simultaneously*! Simply insert the network boards into the 286A expansion slots and choose the appropriate menu options when you configure the operating system, and you have added a network for the price of a board. External bridge software allows you to run more than four networks, if you choose.

Bridged networks can communicate and are user-transparent

No matter how your networks are connected to the 286A, they can all communicate; they all run the same way; and they all run the same application software, so network users never know they are bridging. And they never have to be retrained.

High quality disk drives

Drives and disks used in the 286A are tested extensively to assure quality and reliability.

Supports hardware designed for the IBM PC AT

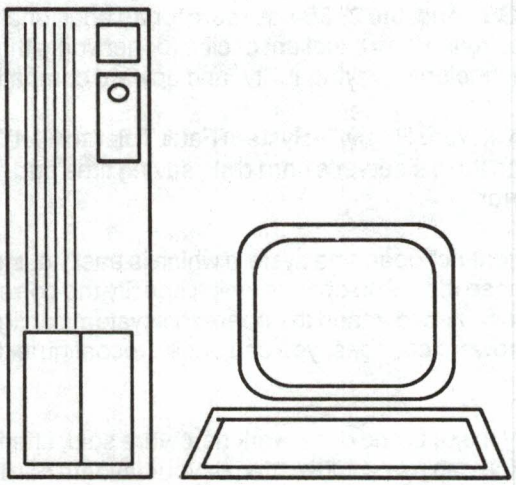
Because the 286A supports boards and peripherals designed for the IBM PC AT, an abundance of hardware options will always be available for your network.

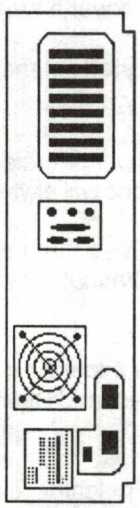
T286A includes fastest tape backup system available for NetWare

Customers who choose the T286A receive an internal-server cartridge tape drive and 60 MB cartridge tape. At 4 MB/minute, it's the fastest backup system available for NetWare networks.

[1]The 286A and the T286A are the same machine, except that the T286A includes a tape backup unit. They will therefore be discussed under the heading 286A.

NetWare Server 286A and T286A





Specifications:

Microprocessor: Intel 80286 running in protected mode
Clock Speed: 8MHz
Wait states: Zero
Addressable Range: 16MB
RAM: 1 - 9MB
Internal Mass Storage:
External Mass Storage: up to 2GB
Hardware Security: Keylock controls keyboard
I/O Expansion Slots: 8 total (6 AT-compatible, 2 PC-compatible)
Printers: 2 serial ports, 1 parallel port
Operating System: Advanced NetWare 286, SFT NetWare Levels I and II
Dimensions: 6.38 x 21.20 x 16.63"
Display: Monochrome Monitor
Clock/Calendar: Real-time, CMOS memory, battery backup

Configuration:

SFT NetWare 286 Level II Operating System installed
1MB memory
42MB internal hard disk
2 serial, 1 parallel printer port
Keycard
360K floppy drive
Monitor
Keyboard
Manuals

The T286A also includes:
5 1/4" tape drive
60MB cartridge tape

NetWare Server 286B and T286B

High performance
9 slots
2MB memory
109 or 183MB initial hard disk
3 printer ports
Disk Coprocessor board speeds disk processing
Room for extra internal disk
Best possible expandability

Preinstalled operating system--"NetWare Ready"

"Generic" operating system is easy to install and maintain

Supports every major topology and brand of network hardware

Run 4 like or unlike networks from same server simultaneously--can bridge more than 4 networks if necessary

Bridged networks can communicate and are user-transparent

High quality disk drives

Supports hardware designed for the IBM PC AT

T286B includes fastest tape backup system available for NetWare

Novell's NetWare Server 286B[2] is a top-of-the-line file server machine. It offers high performance, 9 expansion slots, 2MB memory, 109 or 183MB disk capacity, and 3 printer ports. In addition, it includes a Disk Coprocessor board which allows you to add external disk subsystems which can increase mass storage to as much as 2GB. And, the 286B has room for an additional internal hard disk. These features make it an excellent choice for networks that require the best performance, technology, expandability, and upward compatibility.

The 286B file server is "NetWare Ready"--System Fault Tolerant NetWare 286 Level II is installed right on the file server's hard disk, saving time and money, and reducing room for error.

SFT NetWare 286 is a "generic" operating system which is easily customized to fit a network. Simply choose the menu options which specify the correct information for your specific network, and the operating system configures itself. If your network hardware changes, you can easily reconfigure the operating system.

The 286B supports every major brand of network hardware sold, offering unparalleled flexibility. You can use your existing or your favorite hardware when your network is run by a 286B file server.

The 286B can support up to four different types of networks--*simultaneously*! Simply insert the network boards into the 286B expansion slots and choose the appropriate menu options when you configure the operating system, and you have added a network for the price of a board. External bridge software allows you to run more than four networks, if you choose. No matter how your networks are connected to the 286B, they can all communicate; they all run the same way; and they all run the same application software, so network users never know they are bridging. And they never have to be retrained.

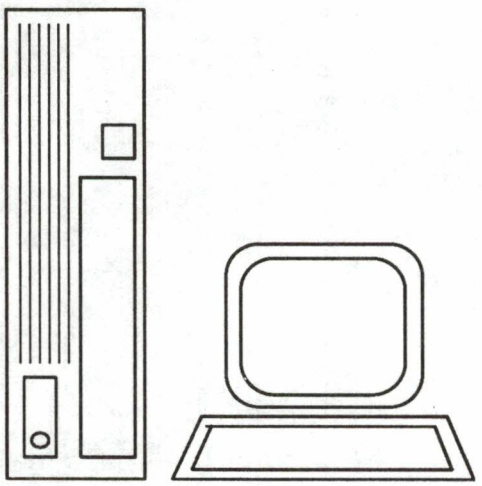
Drives and disks used in the 286B are tested extensively under network conditions to assure quality and reliability.

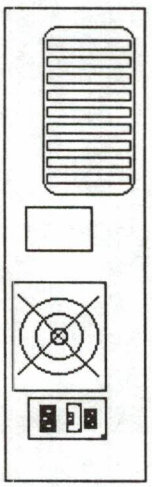
Because the 286B supports boards and peripherals designed for the IBM PC AT, an abundance of hardware options will always be available.

Customers who choose the T286B receive an internal-server cartridge tape drive and 60 MB cartridge tape. At 4 MB/minute, it's the fastest backup system available for NetWare networks.

If you have a large network, or anticipate expansion in the future, the 286B's extra slots, memory, mass storage, drives, and Disk Coprocessor board make it the file server for you.

[2]The 286B and the T286B are the same machine, except that the T286B includes a tape backup unit. They will therefore be discussed under the heading 286B.





Specifications:

Microprocessor: Intel 80286 running in protected mode
Wait States: Zero
Clock Speed: 8MHz
Addressable Range: 16MB
RAM: 2 - 12MB
Internal Mass Storage: 109 - 366MB
External Mass Storage: up to 2GB
Hardware Security: Keylock controls keyboard
I/O Expansion Slots: 9 total (7 AT-compatible, 2 PC-compatible)
Printers: 1 serial port, 2 parallel ports
Operating Systems: Advanced NetWare 286, SFT NetWare Levels I and II
Dimensions: 6.56 x 23.06 x 18.38"
Display: Monochrome Monitor
Clock/Calendar: Real-time, CMOS memory, battery backup

Configuration:

SFT NetWare 286 Level II Operating System installed
2MB memory
109 or 183MB internal hard disk
3 printer ports (2 parallel, 1 serial)
Disk Coprocessor board
360K floppy drive
Monitor
Keyboard
Manuals

The T286B also includes:

5 1/4" tape drive
60 MB cartridge tape

NOTES:

Section 3

NetWare Server Systems

NetWare Server Systems combine the NetWare Operating System and a NetWare file server with specific network boards and connection hardware. NetWare Server Systems thus provide a complete solution to your networking needs.

Components come as a kit, but kits are available in a wide variety of combinations, so NetWare Server Systems are both flexible and convenient.

And service and support are simplified because all components are designed to work together, tested and proven in the given configuration, and covered by the Novell warranty.

This section introduces the following NetWare Server Systems:

* S-Net
* RX-Net
* G-Net
* Ethernet

NetWare S-Net Server Systems

NetWare S-Net Server Systems combine a NetWare Server 68B with S-Net NICs (Network Interface Cards) and S-Net connection hardware.

Basic Components

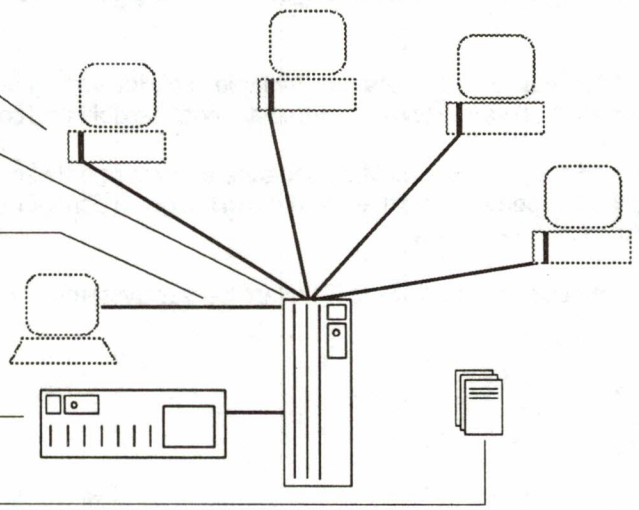
4 S-Net NICs
Four 30' LAN cables

68B file server

10' console cable

NDS2 or NDS4
disk subsystem

Manuals



Features:

NetWare 68B servers are shipped with the SFT NetWare 68 Level I operating system installed. SFT NetWare 68 Level I features:

6-24 physical ports per server
24-128 active workstations per server
Up to 2GB disk storage
Up to 8MB server memory
Dedicated server
5 shared printers
126MB volume sizes
Supports internetworking through NetWare bridges
Reliability proven through market use
Hardware and software supported by same manufacturer
Data protection

You get all the advantages of the 68B server (see the NetWare Servers section).

68B Server Benefits
*Reliable, mature technology proven through 3 years market use
*NetWare-ready
*Supports S-Net and RX-Net
*Easy to install and maintain
*Can bridge to many brands of network hardware

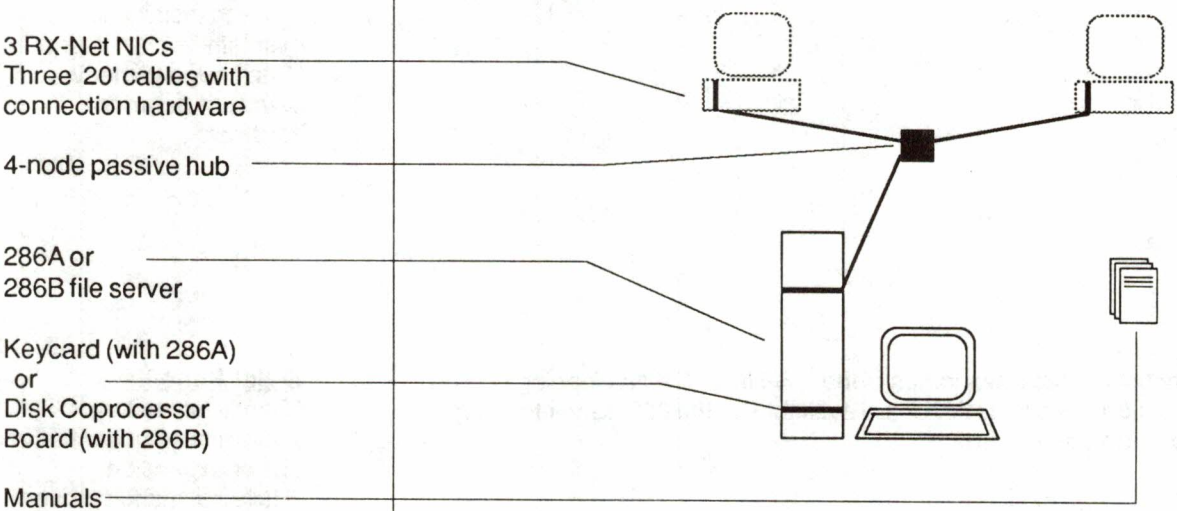
You also benefit from the advantages of the S-Net or RX-Net topology. (You may use the optional RX-Net LAN board available for the 68B server to bridge to the RX-Net topology.)

S-Net Benefits
*Consistent network performance under heavy use or expansion
*Reliable, market proven
*Only one station goes down if its cable fails

RX-Net Benefits
*Easy to install, maintain
*Dependable
*Expandable beyond 24 users
*Good performance for moderate cost
*Easily adapted to physical layout of installation

NetWare RX-Net* Server Systems

NetWare RX-Net Server Systems combine a 286A or 286B file server with RX-Net NICs (Network Interface Cards) and RX-Net connection hardware.


3 RX-Net NICs
Three 20' cables with connection hardware
4-node passive hub
286A or 286B file server
Keycard (with 286A) or Disk Coprocessor Board (with 286B)
Manuals

Features:

NetWare 286A and 286B servers are shipped with the SFT NetWare 286 Level II operating system installed. SFT NetWare 286 Level II features:

100 active workstations per server
Up to 2GB disk storage
Up to15MB server memory
Dedicated server
Up to 5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Disk mirroring
Disk duplexing

*NetWare RX-Net is Novell's ARCNET-compatible network.

You get all the advantages of the 286A or 286B server (see the NetWare Servers Section).

286A Benefits
*High performance with latest technology
*1MB memory, 42MB hard disk, 3 printer ports
*"NetWare Ready"
*"Generic" operating system
*Supports 4 topologies simultaneously and 16 hardware brands through internal/external bridging
*Quality drives and disks
*Supports hardware designed for the IBM PC AT
*T286A, B include 45 or 60MB tape backup system

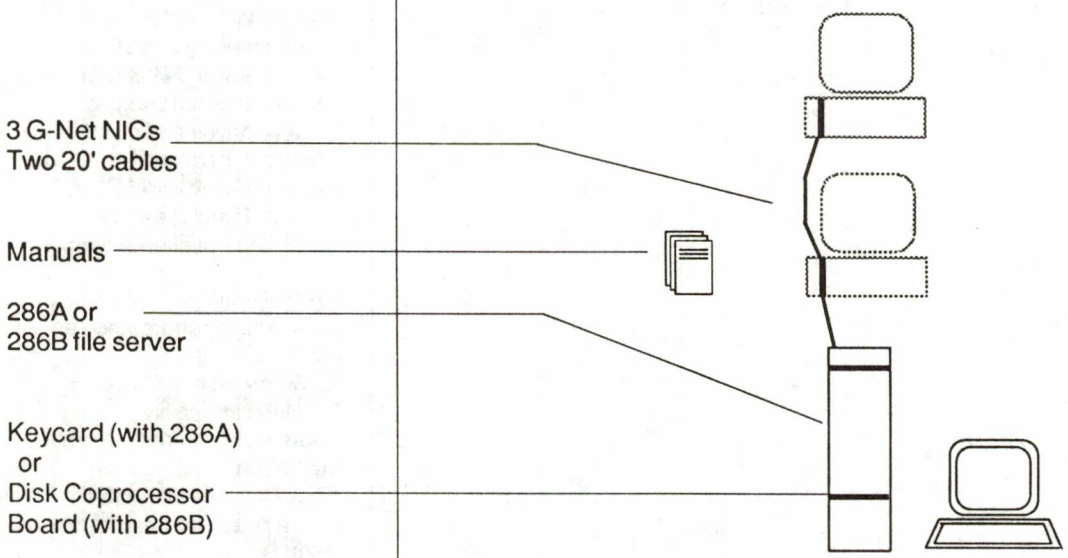
286B Benefits
*Same high performance as 286A
*2 MB memory
*Best expandability
*More slots, memory, storage than 286A
*Disk Coprocessor board
*Extra space for internal disk in 286B

You also benefit from the advantages of the RX-Net topology.

RX-Net Benefits
*Easy to install, maintain
*Dependable
*Good performance for moderate cost
*Easily adapted to physical layout of installation
*RX-Net is Novell's ARCNET-compatible network

NetWare G-Net Server Systems

NetWare G-Net Server Systems combine a 286A or 286B file server with G-Net NICs (Network Interface Cards) and G-Net connection hardware.



Features:

NetWare 286A and 286B servers are shipped with the SFT NetWare 286 Level II operating system installed. SFT NetWare 286 Level II features:

100 active workstations per server
Up to 2GB disk storage
Up to15MB server memory
Dedicated server
Up to 5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Disk mirroring
Disk duplexing

You get all the advantages of the 286A or 286B server (see the NetWare Servers Section).

286A Benefits
*High performance with latest technology
*1MB memory, 42MB hard disk, 3 printer ports
*"NetWare Ready"
*"Generic" operating system
*Supports 4 topologies simultaneously and 16 hardware brands through internal/external bridging
*Quality drives and disks
*Supports hardware designed for the IBM PC AT
*T286A, B include 45 or 60MB tape backup system

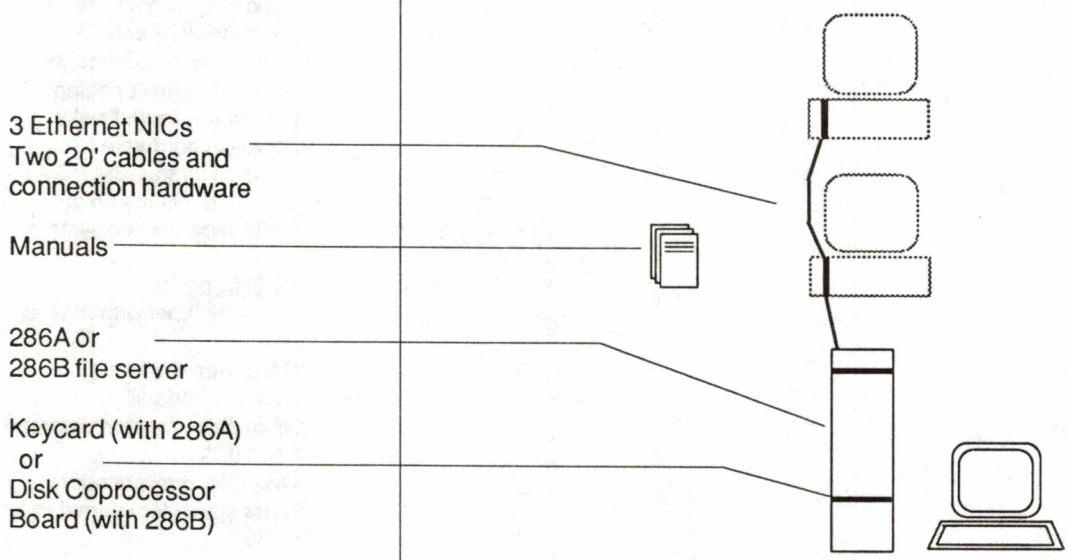
286B Benefits
*Same high performance as 286A
*2 MB memory
*Best expandability
*More slots, memory, storage than 286A
*Disk Coprocessor board
*Extra space for internal disk in 286B

You also benefit from the advantages of the G-Net topology.

G-Net Benefits
Low-cost
Good performance
Easy installation

NetWare Ethernet Server Systems

NetWare Ethernet Server Systems combine a 286A or 286B file server with Ethernet NICs and Ethernet connection hardware.



Features:

NetWare 286A and 286B servers are shipped with the SFT NetWare 286 Level II operating system installed. SFT NetWare 286 Level II features:

100 active workstations per server
Up to 2GB disk storage
Up to15MB server memory
Dedicated server
Up to 5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Disk mirroring
Disk duplexing

You get all the advantages of the 286A or 286B server (see the NetWare Servers Section).

You also benefit from the advantages of the Ethernet topology.

286A Benefits
*High performance with latest technology
*1MB memory, 42MB hard disk, 3 printer ports
*"NetWare Ready"
*"Generic" operating system
*Supports 4 topologies simultaneously and 16 hardware brands through internal/external bridging
*Quality drives and disks
*Supports hardware designed for the IBM PC-AT
*T286A, B include 45 or 60MB tape backup system

286B Benefits
*Same high performance as 286A
*2 MB memory
*Best expandability
*More slots, memory, storage than 286A
*Disk Coprocessor board
*Extra space for internal disk in 286B

Ethernet Benefits
Best performance
Easy installation

NOTES:

Section 4

Independent Server Systems

Independent Server Systems combine NetWare with network boards and hardware. They use separately purchased PCs as file servers. These PCs must be IBM compatible.

Independent Server Systems provide all the benefits of a NetWare package while allowing you to use your preferred or previously-purchased hardware.

Independent Server Systems are available in Starter Kits, which are classified according to topology and NetWare type.

Topologies include:

* RX-Net
* G-Net
* Ethernet

NetWare types and Starter Kits include:

* **SFT NetWare Starter Kits**, which combine the SFT NetWare operating system with enough network hardware for one dedicated file server and two workstations.

* **Advanced NetWare 286 Starter Kits**, which combine Advanced NetWare 286 with enough network hardware for one dedicated file server and two workstations.

* **Advanced NetWare 86 Starter Kits**, which combine the Advanced NetWare 86 operating system with enough network hardware for one non-dedicated file server and one workstation.

* **Non-Dedicated Advanced NetWare 286 Starter Kits**, which combine the Advanced NetWare 286 operating system with enough network hardware for one non-dedicated file server and one workstation.

This section introduces the following Independent Server Systems:

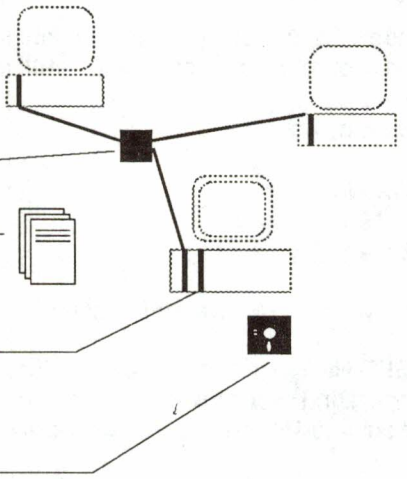
* RX-Net
* G-Net
* Ethernet

RX-Net Independent Server Systems

ARCNET-compatible

RX-Net Server Systems combine NetWare with RX-Net NICs (Network Interface Cards) and RX-Net connection hardware, combining the advantages of your chosen server with the advantages of NetWare and the RX-Net topology. RX-Net NICs are ARCNET-compatible.

SFT NetWare or Advanced NetWare 286 Starter Kit



3 RX-Net NICs
Three 20' cables with connection hardware

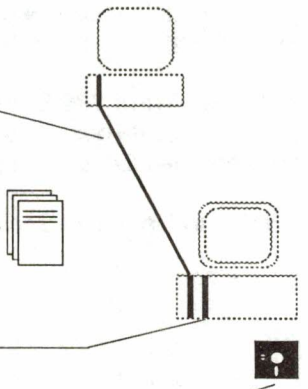
4-node passive hub

Manuals

Keycard (with 286A)
or
Disk Coprocessor board (with 286B)

SFT NetWare
or
Advanced NetWare 286

Advanced NetWare 86 Starter Kit



2 RX-Net NICs
20' cable with connection hardware

Manuals

Keycard
or
Disk Interface board (you specify)

Advanced NetWare 86

Advantages of the RX-Net topology:

Easy to install and maintain
Dependable
Good performance for moderate cost
Easily adapted to arrangement of installation sites

SFT NetWare and Advanced NetWare 286 features:

100 active workstations per server
2GB disk storage
15MB addressable server memory
Dedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Advanced NetWare 286 upwardly compatible with SFT NetWare

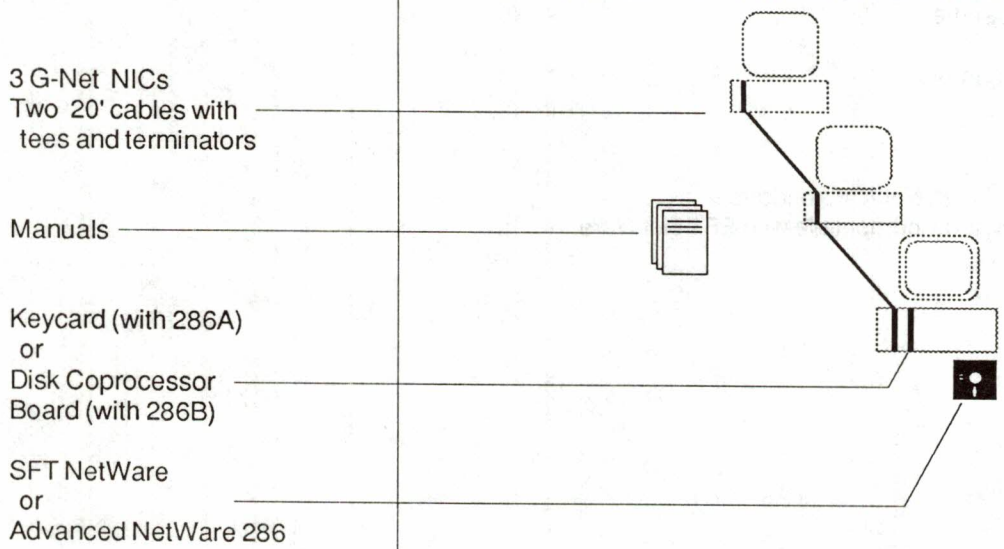
Advanced NetWare 86 features:

100 active workstations per server
255MB disk storage
640KB addressable server memory
Dedicated or nondedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Upwardly compatible with Advanced NetWare 286 and SFT NetWare if IBM AT or compatible server is used

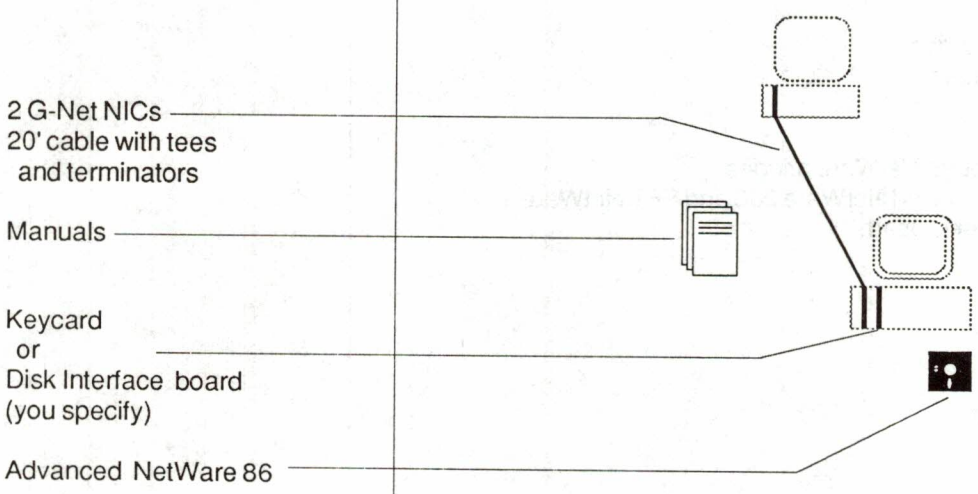
G-Net Independent Server Systems

G-Net Independent Server Systems combine NetWare with G-Net NICs (Network Interface Cards) and G-Net connection hardware, combining the advantages of your chosen server with the advantages of NetWare and the G-Net topology.

SFT NetWare or Advanced NetWare 286 Starter Kit


3 G-Net NICs
Two 20' cables with tees and terminators
Manuals
Keycard (with 286A) or Disk Coprocessor Board (with 286B)
SFT NetWare or Advanced NetWare 286

Advanced NetWare 86 Starter Kit



Advantages of the G-Net topology:

Low cost
Easy installation
Good performance

SFT NetWare and Advanced NetWare 286 features:

100 active workstations per server
2GB disk storage
15MB addressable server memory
Dedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Advanced NetWare 286 upwardly compatible with SFT NetWare

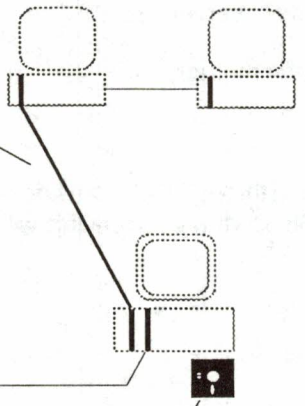
Advanced NetWare 86 features:

100 active workstations per server
255MB disk storage
640KB addressable server memory
Dedicated or nondedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Upwardly compatible with Advanced NetWare 286 and SFT NetWare
if IBM AT or compatible server is used

Ethernet Independent Server Systems

Ethernet Independent Server Systems combine NetWare with Ethernet NICs (Network Interface Cards) and Ethernet connection hardware, combining the advantages of your chosen server with the advantages of NetWare and the Ethernet topology.

SFT NetWare or Advanced NetWare 286 Starter Kit



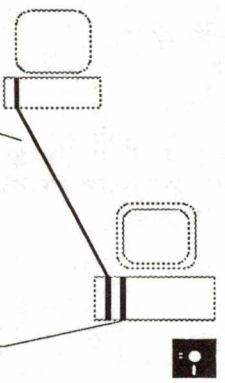
3 Ethernet NICs
(NIC in file server is an enhanced Ethernet NIC)
Two 20' cables with connection hardware

Manuals

Keycard (with 286A)
or
Disk Coprocessor board (with 286B)

SFT NetWare
or
Advanced NetWare 286

Advanced NetWare 86 Starter Kit



2 Ethernet NICs
20' cable with connection hardware

Manuals

Keycard
or
Disk Interface board
(you specify)

Advanced NetWare 86

Advantages of the Ethernet topology:

Best performance
Easy installation

SFT NetWare and Advanced NetWare 286 features:

100 active workstations per server
2GB disk storage
15MB addressable server memory
Dedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Advanced NetWare 286 upwardly compatible with SFT NetWare

Advanced NetWare 86 features:

100 active workstations per server
255MB disk storage
640KB addressable server memory
Dedicated or nondedicated server
5 shared printers
255MB volume sizes
Supports internetworking through NetWare bridges
Upwardly compatible with Advanced NetWare 286 and SFT NetWare if IBM AT or compatible server is used

NOTES:

Section 5

NetWare Subsystems

Novell's NetWare subsystems provide an excellent means of increasing the file server's hard disk capacity and backing up valuable data.

NetWare subsystems are available in three models. The NDS2 and NDS4 house two and four drives, respectively. The NDS2-T houses a cartridge tape drive.

Add-on and add-in disks, controllers, and tape drives are also available.

This section introduces the following NetWare subsystems:

* NDS2 and NDS4 subsystems
* NetWare Add-on and Add-In Drives
* NetWare Tape Backup Units

NDS2 and NDS4 Subsystems

Novell manufactures two NetWare Disk Drive Subsystems, the NDS2 and the NDS4.

NDS2--basic storage subsystem, entry-level price

The NDS2 is an excellent choice for investment-conscious, small to mid-sized network installations because it provides a basic storage subsystem for an entry-level price. It houses two drives, either standard (23 and 47 MB) or high capacity (109 and 183MB).

NDS4--best expandability, best price per megabyte

The NDS4 is an excellent choice for small to large installations anticipating significant expansion because it saves space and provides the best possible expandability, as well as the best price per megabyte of storage. It houses four high-capacity drives (109 or 183MB).

Both systems UL approved

The NDS2 and NDS4 come with one drive of the specified capacity. Add-on disk drives may be installed in the remaining slots.

Both subsystems are flexible, fast, and reliable.

Variety of configurations available, add-on drive expandability, daisy-chain up to 2GB

They're flexible because they are available with a variety of drive sizes; they offer add-on drive expandability; and they can be daisy-chained for a total storage capacity of over 2GB.

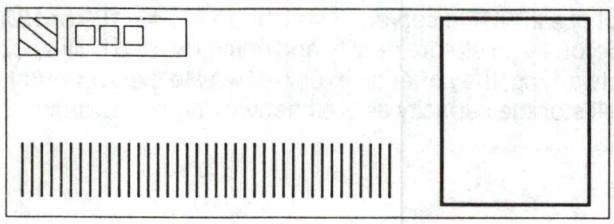
Multiple disk channel access 30-35 ms access speed

They're fast because they have multiple disk channel compatibility from a single server and a 30-35 millisecond average disk access speed.

Designed for networking
Tested extensively
Novell warranty

And they're reliable because they are designed specifically to stand up to the rigorous demands of networking, tested extensively, and carry the same vendor warranty as Novell's file servers and software.

NDS2 Subsystems



Houses two disks or one disk and one tape drive

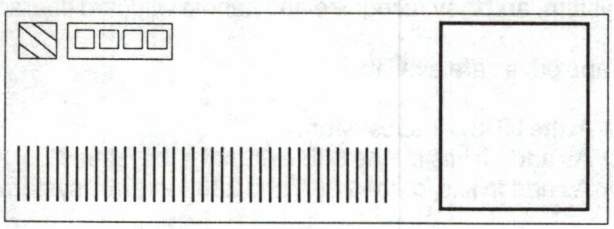
Disks may be high capacity (109 or 183MB)
or
Standard capacity (23 or 47MB)

Comes with 23, 47, 109 or 183MB disk drive

NOTE: High and standard capacity disk drives cannot be mixed

Power and space to add one more drive

NDS4 Subsystems



Houses 4 disk drives or 3 disk drives and a tape drive (tape drive in external subsystem usable only with 68B file server)

Comes with 109 or 183MB drive

High capacity disk drives only (109 or 183MB)

Power and space to add 3 more disk drives

NOTE: Third disk drive requires controller (2 disks per controller)

NetWare Add-on and Add-in Drives

Novell's NetWare add-on drives may be installed in an empty slot of an NDS2 or NDS4 subsystem; add-in drives may be installed in the empty slot of a 286B file server. Available in 27, 43, 109 or 183MB sizes, tested rigorously to ensure quality and reliability, and built specifically for networking, they offer an excellent way to expand your file server's hard disk storage capacity as your networking needs grow.

NetWare Tape Backup Units

Designed and warrantied by Novell for NetWare systems, NetWare Tape Backup Units are the fastest backup systems available for NetWare Networks (4 MB/minute, streaming tape mode). They are convenient, too, because they allow you to restore by file, directory, volume, disk, or system, and they recognize and handle wildcard characters.

Tape drives are available

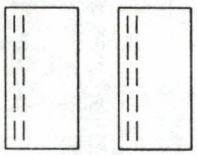
1) In the NDS2-T subsystem
2) As add-on kits for the 68B external subsystems
3) As add-in kits for the 286A and 286B internal systems

Tape drives may be installed in the NDS2 or NDS4 subsystems only if the subsystems are being used with the 68B file server. If you wish to use a tape drive with a 286A or 286B file server, the tape drive must be installed in the file server's internal slot.

With 60MB tape cartridges, NetWare Tape Backup Units offer a fast, reliable, cost-effective way to protect valuable data.

NetWare Add-on Drives

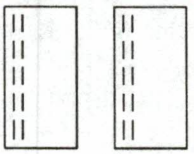
Standard Capacity



23MB 47MB

Install in
standard-capacity NDS2 subsystems

High Capacity



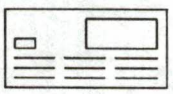
108MB 183MB

Install in
high-capacity NDS2 subsystems or
NDS4 subsystems and
NetWare Server 286B

Add-on disk drives with controllers are also available. Two disk drives run off one controller, so the third drive added to an NDS4 must be an add-on drive with a controller.

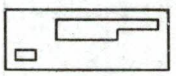
NetWare Tape Backup Units

Add-on Tape Drive
for 68B



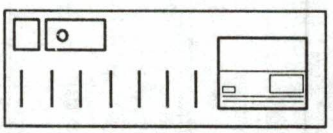
Install in
NDS2 or NDS4 external subsystem
being used with 68B server

Add-in Tape Drive
for 286A and 286B



Install in
empty slot of
286A or 286B server

NetWare Tape Subsystem NDS2-T



Use with 68B systems only

2 slots per box

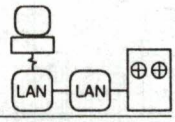
Tape drive in one slot

Empty slot for add-on hard disk drive

NOTE: If you install an add-on disk drive in the empty slot of an NDS2-T, it must be a drive with a controller.

NOTES:

Section 6



NetWare Communications Products

NetWare Communications products ensure that Novell networks can communicate with remote PCs, other LANs, and host mini or mainframe computers. Communication is transparent to users--it doesn't affect normal network operation.

1) LAN- to-Remote PC

LAN-to-Remote PC
NetWare Remote
NetWare ACS Server

NetWare Remote lets nondedicated remote workstations (workstations which are not physically connected to the network) use the network. It provides lower-cost, remote execution.

The **NetWare Asynchronous Communications (ACS) Server** also lets remote workstations communicate with the network. However, workstations must be dedicated. The ACS Server provides faster, local execution.

2) LAN-to-LAN

LAN-to-LAN
Bridges (internal and external)

Internal and external **NetWare bridges** let LANs communicate with other LANs. For example, a Token Ring network can talk to an RX-Net network.

3) LAN-to-Host

LAN-to-Host
NetWare SNA Gateway
NetWare ACS Server

The **NetWare SNA Gateway** lets LANs communicate with IBM SNA host computers.

The **NetWare Asynchronous Communications Server** lets LANs communicate with asynchronous host computers such as DEC, Burroughs, AT&T and Data General. It also lets LAN users access async public services such as The Source and Dow Jones.

This section introduces the following NetWare Communications products:

* NetWare Remote
* NetWare Bridges
* NetWare SNA Gateway
* NetWare Asynchronous Communications Server

NetWare Remote

(LAN-to-Remote PC Communication)

Allows remote workstations to use network

NetWare Remote allows workstations that are not physically connected to a network to use the network just as if they were connected to it.

Software included with Advanced NetWare 1.0 and above

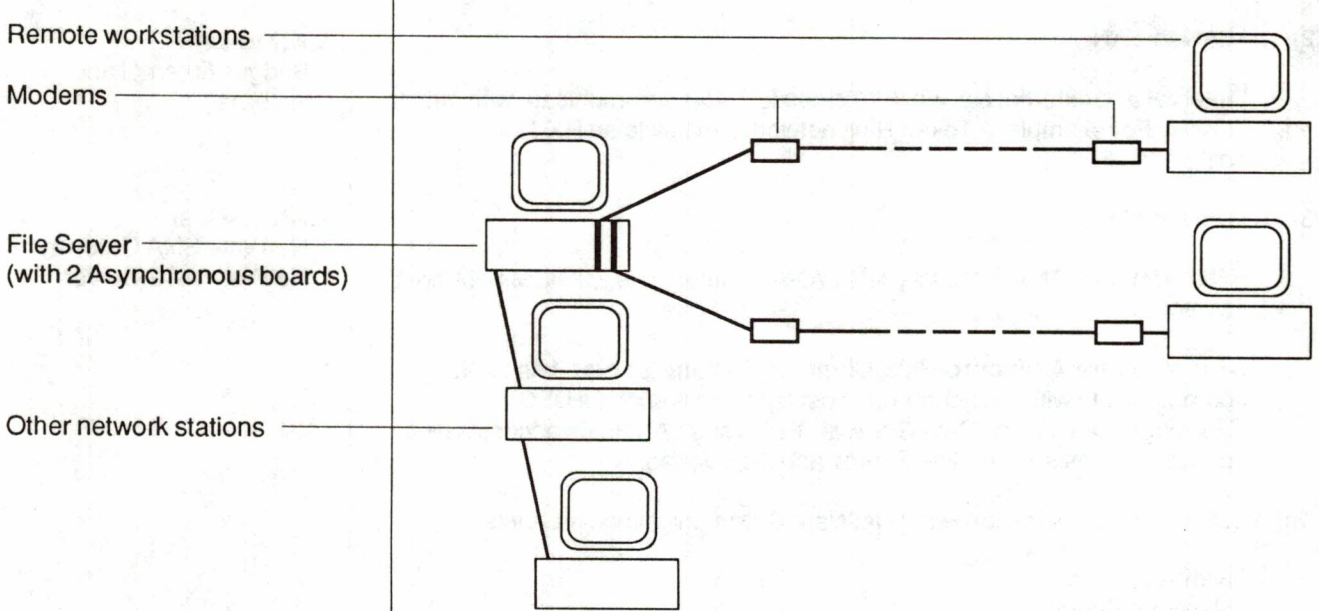
The software needed to run NetWare Remote is included with each Advanced NetWare Operating System (1.0 and higher), and may be used with any number of workstations. You'll also need an aysnchronous board and two modems for each remote workstation (one for the "workstation end" and one for the "network end"). The asynchronous board(s) may be located in the file server itself (internal configuration) or in a PC acting as an external bridge (external configuration), since NetWare Bridge Software also supports NetWare Remote.

NetWare Bridge Software also supports NetWare Remote

User-transparent

NetWare Remote is user-transparent--it doesn't affect normal network use, so users never even need to know it's there.

NetWare Remote
Sample Configuration
(internal shown)



NetWare Bridges

(LAN-to-LAN Communication)

NetWare Bridges connect up to 4 like or unlike networks simultaneously. There are two kinds of bridges, internal and external. Both are completely transparent to users.

Internal bridging is accomplished by putting multiple network boards (up to 4) in one file server, and running all the networks from that file server. (Only versions 2.0 and above of Advanced NetWare 86, Advanced NetWare 286, and SFT NetWare systems support multiple boards in the file server.)

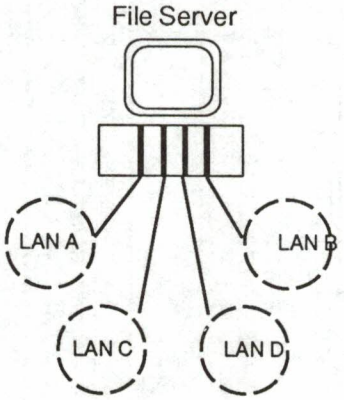
External bridging is accomplished by running special bridge software in a workstation, and connecting the networks you wish to bridge to that workstation. Each external bridge can connect up to four networks. Generally, external bridges are used if all slots in the file server are full, or if wiring considerations or network limitations rule out internal bridges. External bridges may also function as line repeaters.

Either way, bridges are easy to install and maintenance-free once they are configured. Bridges allow you to connect networks which use any of the hardware types which NetWare supports. All bridged networks can communicate, and all function the same way. Any user can access any information on any file server (within the limits of network security).

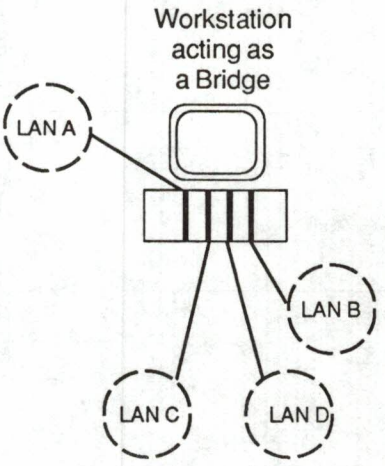
More than one network board of the same type may be put in the file server, allowing you to increase network performance for the price of the additional board.

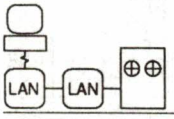
- Connect up to 4 like or unlike networks simultaneously
- User-transparent
- Internal bridging--multiple boards in file server
- External bridging--special bridge software running in a PC that acts as a bridge
- Easy to install
- Maintenance-free once configured
- Connect networks which use any of the 26 hardware types NetWare supports
- Can put more than one network board in file server to increase network performance

Internal Bridging
Sample Configuration



External Bridging
Sample Configuration





NetWare SNA Gateway

(LAN-to-Host Communication)

LAN to IBM SNA host

Gateway software runs in nondedicated PC which acts as gateway for whole LAN

Communicate over dial-up, leased, point-to-point, multi-dropped lines at up to 19.6K baud

Up to 32 concurrent sessions

Coexists w/ other IBM devices

Run DOS and Gateway software concurrently. Session Hold--switch between DOS and host

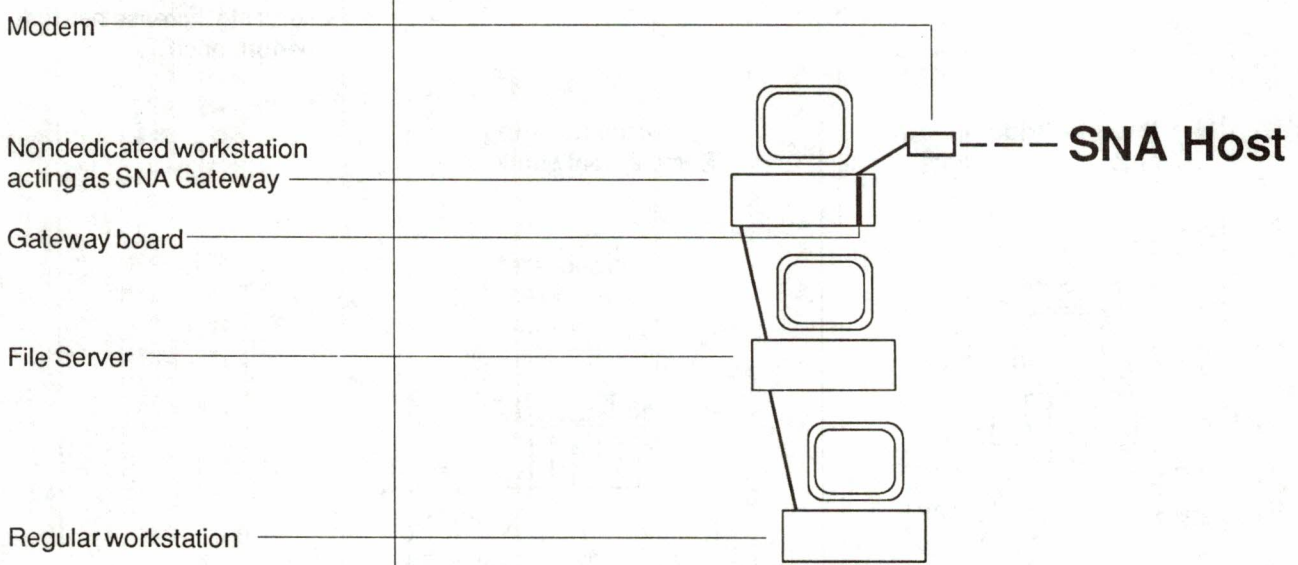
Can have more than one gateway on network

Novell's SNA Gateway allows network users to communicate with an IBM SNA host computer. Gateway software resides in a nondedicated personal computer workstation, which maintains communications between the network and the host. Network users can run host application packages, download host files, and process data at their workstation. They can then return their data to the host, or save data on the network, or print on a network printer.

Communication may take place over dial-up, leased, point-to-point, or multi-dropped lines at speeds of up to 19.2K baud. The SNA Gateway supports up to 32 concurrent sessions and can coexist with other IBM devices. DOS and the Gateway software can be run concurrently, allowing the workstation to be used for normal processing while maintaining communication with the host. A feature called Session Hold allows users to switch back and forth between DOS applications and the host connection. Each station may have up to 5 SNA sessions active at once.

More than one gateway can be installed on the network, allowing users to access a number of hosts or run more than one session if necessary.

NetWare SNA Gateway
Sample Configuration



NetWare Asynchronous Communications Server

(LAN-to-Host and LAN-to-Remote PC Communications)

LAN-to-Host

Novell's Asynchronous Communications Server (NetWare ACS) provides LAN-to-Host communication and allows any workstation on a LAN to call out to an asynchronous host or public service (DOW Jones, The Source, MCI Mail, etc.). The ACS can have up to 12 ports, meaning that up to 12 workstations can call out through the ACS at one time.

The user can upload and download files between the LAN and the host. This makes it possible to obtain mainframe information and integrate it on a local workstation basis.

The components that make LAN-to-Host communications possible are:

1) One, two, or three **Wide Area Network Interface Module (WNIM)** boards installed in the ACS server. Each WNIM will support four ports.
2) **NetWare ACS Software and the ASCOM IV application software.** ASCOM IV is the software package that allows the workstation to call out to asynchronous hosts.
3) A **dedicated PC AT, PC XT, or look-alike** with exactly 256K to function as the communications server.
4) Associated modems and communication lines for each port on the WNIMs.

LAN to Async Host or public service

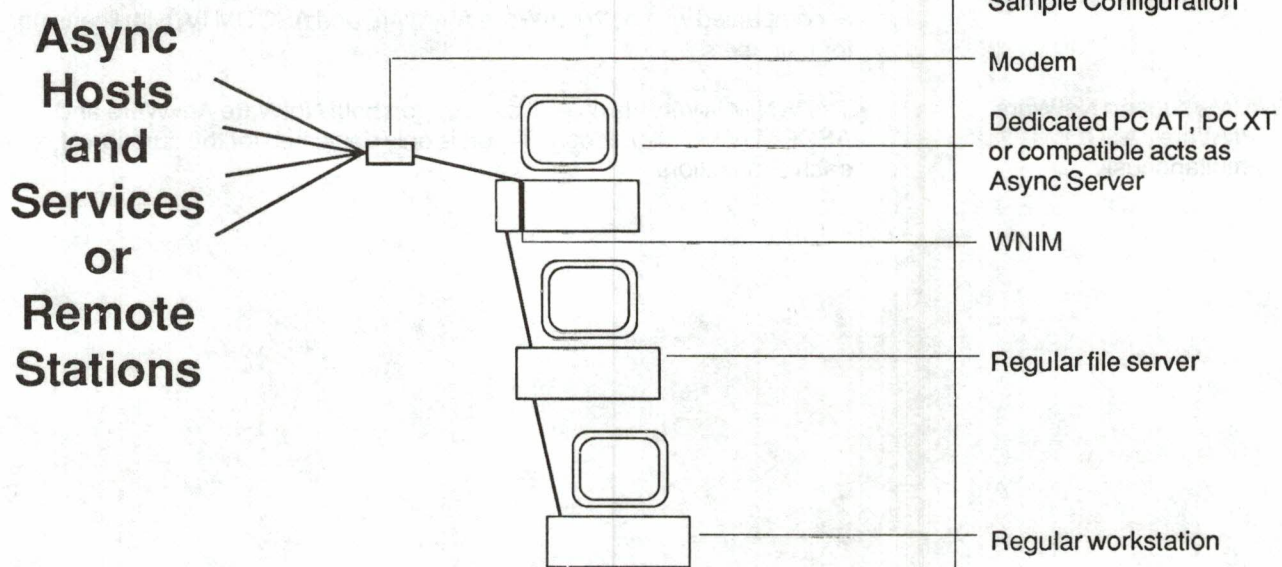
Up to 12 workstations can call out

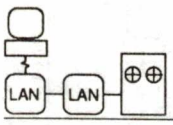
Can upload and download files from host and save them on network

Components:

1-3 WNIMS
NetWare ACS, ASCOM IV
Dedicated PC AT, PC XT, or lookalike with 256K (acts as ACS server)
Modems, communication lines

NetWare ACS
Sample Configuration


Async Hosts and Services or Remote Stations
Modem
Dedicated PC AT, PC XT or compatible acts as Async Server
WNIM
Regular file server
Regular workstation



LAN-to-Remote PC

LAN-to-Remote PC

The ACS Server also provides LAN-to-Remote PC communications using the NetWare AnyWare software. This allows a workstation located remotely to connect to the LAN and function as if connected directly to the LAN.

Local execution speeds processing

NetWare AnyWare uses local execution, meaning that the processing takes place locally on a dedicated LAN workstation, as opposed to taking place on the remote workstation. This results in faster processing speeds because less data needs to go over the telephone line. Essentially, the only information traveling over the telephone line is screen images and keystrokes.

Requires dedicated workstation on network for duration of session

Local execution requires a workstation on the LAN to be dedicated for the duration of each connection. Local execution takes place in this dedicated workstation. When the dedicated workstation is not processing for a remote workstation, it is free to function as a regular workstation on the LAN. In other words, it is only dedicated when a remote workstation is attached.

Components:

1-3 WNIMS
NetWare ACS, NetWare AnyWare
Dedicated PC AT, PC XT, or look-alike with 256K (acts as ACS server)
Modems, communication lines

The components that make LAN-to-Remote PC communications possible are:

1) One, two, or three **Wide Area Network Interface Module (WNIM)** boards installed in the ACS server. Each WNIM will support four ports.
2) **NetWare ACS Software and the NetWare AnyWare application software package.** NetWare AnyWare is the software package that allows a remote workstation to connect to the local workstation on the LAN.
3) A **dedicated PC AT, PC XT, or look-alike** with exactly 256K to function as the communications server.
4) Associated modems and communication lines for each port on the WNIMs.

WNIMs licensed for 4 users

The ACS Server is unique in the marketplace because it provides both LAN-to-Host and LAN-to-Remote capabilities. Each WNIM board is accompanied with both NetWare AnyWare and ASCOM IV, with licensing for four users.

WNIMs support NetWare AnyWare , ASCOM IV simultaneously

The WNIM is very flexible. It can support both NetWare AnyWare and ASCOM IV simultaneously. A port is only dedicated for the duration of each connection.

Section 7

Appendix A: NetWorking, An Introduction

LANs are **Local Area Networks**, and they're useful because they can help you work better and faster. Why? Because LANs link isolated PCs, allowing the people who use them to **communicate** and **share resources.**

The more readily people can communicate, the better they can work. When the PCs where people work are linked, it's easier for people to communicate, so they can work more efficiently. (Imagine, for example, trying to run your business without using a telephone.)

Also, the more readily people can share resources, the faster they can work. When PCs tap in to a central source of resources, it's easier for people to share those resources, so they can work more quickly. (Imagine, for example, the difference between finding files on a central hard disk vs. searching through a number of floppy disks in different peoples' desks.)

Sharing resources also spreads the cost of aplication programs, hard disks, printers, etc. among all network users. Plus, NetWare eliminates the inefficiency of working with multiple versions of multiple files on multiple floppy diskettes. NetWare also eliminates waiting in line to use peripherals, such as printers.

Efficient sharing of resources and efficient communication saves time and money.

Linking PCs so they can "talk" and share resources from a central location implies that

1) You have some number of isolated (standalone) PCs.

2) The resources they share should be accessible from a central location.

3) The PCs should be linked to the central location.

4) A monitoring device that oversees how the PCs share resources and communicate should be found in the central location.

What are LANs, and Why are They Useful?

Link isolated PCs

Share resources

Communicate

Network Needs

Link isolated PCs to central source of resources and monitoring device

Answering Network Needs

PCs connect to file server, where networking software runs

Most networks answer these needs in roughly the same way.

A number of standalone PCs called **workstations** are linked directly or indirectly to a special PC called a **file server**. The file server's hard disk is the central location from which shared software resources, such as data and program files, may be accessed. Hardware resources such as printers and disk subsystems are connected directly to the file server. **Networking software** on the file server's hard disk monitors network operation, including sharing of resources and network communications.

What's in a LAN?

PCs (workstations)

File server

Cabling and connection hardware

Peripherals

All LANs have at least three basic units:

1) **Workstations**--the PCs where people work

2) **File server** or disk server--a special PC where shared software resources are stored, including the network software which monitors network operation. Novell networks use file servers, which are superior to disk servers.

3) **Cabling and connection hardware**--the equipment used to connect workstations to the file server, whether directly or indirectly. This includes network interface cards (circuit boards which go in the file server and workstations), cabling, and various types of connection hardware, depending on the system.

LANs may also have a variety of optional peripherals, which are connected directly to the server:

1) Printers

2) Disk subsystems--increase the file server's hard disk storage

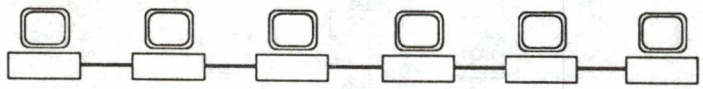
Connecting to the File Server: Topologies

Networks use sets of rules and standards called **protocols**. A network's protocol is determined by the network interface board, and involves the cable type the network uses, how network signals travel along the cable (cable access scheme and transmission rate), and how the network is cabled (topology).

These factors greatly influence a network's price and performance. One of the keys to choosing the right network is determining which type of network gives the best price performance ratio for a given installation's needs, so an overview of the most common network topologies follows.

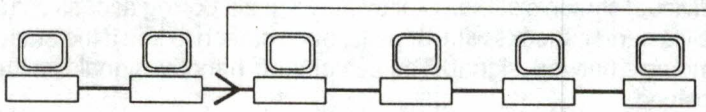
Linear Bus

In Linear Bus systems, all stations are connected directly to a central length of cable called the trunk cable or bus.



Stations connect directly to trunk cable (bus)

Network signals travel along the trunk, using a contention cable access scheme: when a workstation needs to send a signal to the file server, the workstation "listens" to see if another workstation is sending a signal, and waits until the coast is clear before sending the signal.



One signal travels on network at a time

Other stations "listen" and wait til cable is clear before they send signals

Advantages of Linear Bus systems include:

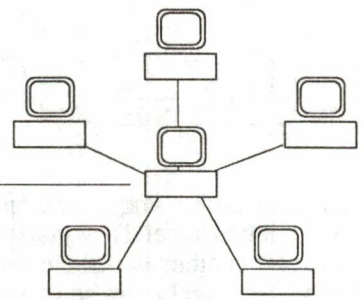
* Easy and inexpensive to install (requires least amount of cable)

Disadvantages include:

* Whole network goes down if the trunk cable fails at any point
* Cable failures difficult to isolate
* Network performance decreases under heavy network use and as additional stations are added

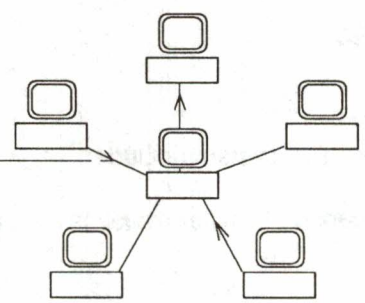
Star

In Star systems, all stations are connected directly to a central point, usually the file server.



Stations connect directly to central point

Network signals travel from the server to the station along each individual station's cable. Star systems use a polling access scheme: the file server checks with, or polls, each station to see if the station is sending a network signal. The server then handles signals as they are received.



Signals travel along each station's cable

Advantages of Star systems include:

* Consistent network performance under heavy network use and as additional workstations are added
* Reliable, market-proven
* No data collisions
* Only individual workstation goes down if its cable fails
* Easily modified

Disadvantages include:

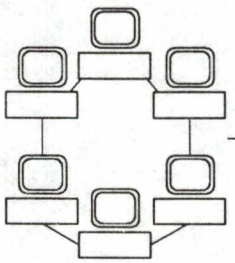
* May be more cumbersome and costly to install, since each workstation requires its own cable

Variation: Distributed Star

A variation of the Star topology is the Distributed Star topology. Stations are linked directly to connection boxes called wire centers or hubs. Then the connection boxes are linked to form a "string of stars."

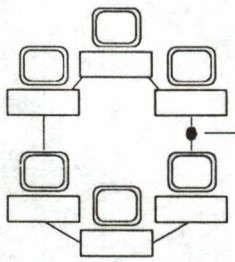
Ring

In Ring systems, stations are connected to each other in a ring.



Stations connect to each other in a ring

Network signals travel from station to station in a ring, using a token-passing scheme. A token travels from station to station. When a station needs to send a message, it takes control of the token. Then, when the station finishes sending the message, the token is freed for another station's use. A station must have control of the token to send a message.



Token travels from station to station in a ring

Station must have token to send signal

Advantages of this system include:

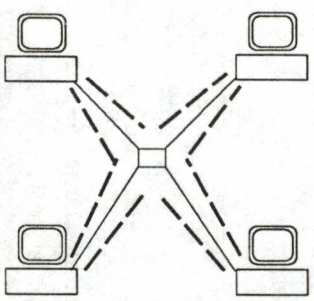
* Cable breaks easily detected

Disadvantages of this system include:

* Whole network goes down if the cable fails at any point
* Difficult to modify

A variation of the Ring topology is the Star-Wired Ring topology. Groups of stations are linked directly to a central point, usually a wiring concentrator. The central points are then linked. Network signals pass from station to station in a ring, as shown by the dotted lines below.

Variation: Star-Wired Ring



NOTES:

Appendix B: NetWare-Supported Hardware

Advanced NetWare 2.0a contains the 14 drivers listed in the first column, and is sold by 19 OEMs (also listed in the first column). The drivers will support the networks listed in the second column.

The 14 NetWare Drivers

AT&T StarLAN
Allen-Bradley Vista LAN/PC
Corvus Omninet
Gateway G/NET
IBM PC Cluster
IBM PC Network
IBM Token Ring
Nestar PLAN 2000
Novell S-Net
Orchid PCnet
Proteon ProNET
Standard Microsystems ARCNET
3Com EtherLink
3Com EtherLink Plus

Novell's OEMs

Allen-Bradley
Asher Technology
Bertelsmann AG.
Conterm
Corvus Systems
Gateway Communications
Molecular Computer
NEC Information Systems Australia
NetWorth Engineering
North Star Computers
Orchid Technology
Proteon, Inc.
Racal Milgo Ltd.

NetWare-Supported Networks

Allen-Bradley LAN/PC
AST PCnetII
AT&T StarLAN
Corvus Omninet
Davong MultiLink
Gateway G/NET
IBM PC Cluster
IBM PC Network
IBM Token-Ring Network
MICOM-Interlan Ethernet
Molecular System 16/300
Nestar PLAN 2000
Networth vLAN
North Star Dimension
Novell NetWare RX-Net
Novell NetWare EtherLink Plus
Novell NetWare G-Net
Novell S-Net
Orchid PCnet
Proteon ProNET
Quadram Quadnet VI
Quadram Quadnet IX
Racal-Milgo PLANET
Santa Clara Systems PCnet
Sperry USERNET
Standard Microsystems ARCNET
Sytek System 6000
Televideo Personal Mini
Texas Instruments EtherLink
Tiara Systems TiaraLink
3Com EtherLink
3Com EtherLink Plus
Ungermann-Bass Net/One
Univation Uninet

Appendix C: How to Get More Information

Detailed information on a given product may be found in product specification sheets available from your local NetWare dealer.

In addition, the following documents are available from Novell.

LAN Software Report 1986 (106 pp., technical)
Detailed discussion of LAN standards (DOS 3.1, NETBIOS, file server) and their effect on the LAN marketplace. In-depth comparison of Novell NetWare, IBM PC Network, 3Com 3+ operating systems. Includes benchmark tests which measure performance of these operating systems.

LAN Evaluation Report 1986 (76 pp., technical)
Detailed discussion of LAN hardware, including cable types, network interface cards, specific LAN hardware implementations, file servers, etc. Includes an evaluation of how various hardware components affect system performance. Explanation of the NetWare Evaluation System, a method of determining hardware performance and matching it to intended network use.

To obtain these documents, write to

Literature Department
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